ROBOSA (Robot Box Smart Adventure): As a Medium for Social and Emotional Stimulation for Children Aged 4-5 Years

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Abstract

Based on the results of observations and interviews in several kindergartens, there are still quite a lot of children aged 4-5 years who experience problems, namely difficulties in recognizing emotions, expressing them appropriately, cooperating with friends, waiting their turn, and resolving simple conflicts during play. Children also tend to become easily angered when their desires are not met and are not yet able to control their emotions independently. Meanwhile, social-emotional skills are an important aspect that needs to be stimulated from an early age because they play a role in helping children recognize, understand, express, and manage emotions and build positive social relationships. To optimize the social-emotional development of children aged 4-5 years, interesting and innovative media are needed. One of them is ROBOSA (Robot Box Smart Adventure), an educational game media designed to stimulate the social-emotional skills of children aged 4-5 years. ROBOSA was developed in the form of an interactive robot that combines four types of games, namely GeoBox, MoodBox, WordBox, and SolveBox, so that children have the opportunity to recognize various emotions, express feelings, communicate, cooperate, and determine appropriate responses to various simple situations. This study used the Research and Development (R&D) method with the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The research instruments used were social-emotional skills observation sheets and material and media validation questionnaires. The validation results by media experts, material experts, and PAUD teachers showed that ROBOSA is in the very suitable category for use as a learning medium. Implementation of the media in small and large group trials demonstrated that ROBOSA was able to attract children's interest in actively participating in play activities while simultaneously stimulating their social-emotional skills. These findings indicate that ROBOSA has the potential to be an innovative play medium to support the stimulation of social-emotional development in children aged 4-5 years through interactive and enjoyable learning experiences.

Keywords: Early Childhood; Social and Emotional Development; Educational Media

1. Introduction

Technological developments in the digital era have brought changes to various aspects of life, including early childhood education. Early childhood education focuses not only on reading, writing, arithmetic, and memorization skills, but also on optimizing all aspects of a child's development, including social-emotional development. Social-emotional skills are an

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important foundation for children to recognize, understand, express, and manage their emotions, as well as build positive relationships with others. Children with good social-emotional development tend to be better able to adapt to their environment, cooperate, show empathy, and resolve conflicts positively (Aghnaita & Irmawati, 2022).

Social-emotional development is an important milestone to be stimulated from an early age. Children who do not receive appropriate stimulation to recognize and manage their emotions are at risk of experiencing difficulties in social interaction, self-control, and adjustment to their environment in later stages of development (Aghnaita & Irmawati, 2022)Therefore, the ability to recognize various emotions, understand the relationship between situations, emotions, and actions, and express emotions appropriately needs to be cultivated through enjoyable play activities that are appropriate to the characteristics of early childhood. Play-based learning provides opportunities for children to interact, communicate, collaborate, and learn to manage emotions through meaningful experiences (Purwaningsih et al., 2022; Putri et al., 2021).

Technological developments also open up opportunities to provide more interactive, innovative learning media that are tailored to the characteristics of early childhood. One innovation that has been widely developed is educational games, which can increase children's engagement in the learning process. Through play, children have the opportunity to explore, interact, communicate, and learn from direct experience, making the learning process more meaningful. Research shows that the use of interactive games can improve children's social interaction skills, recognize emotions, and develop emotional regulation through enjoyable play activities (Sulistyawati et al., 2023)

Play media specifically designed to stimulate the social-emotional development of children aged 4–5 years is still relatively limited. However, during this age range, children are at a critical stage in developing the ability to recognize emotions, understand their own and others' feelings, demonstrate empathy, and manage them. Based on previous research, the media used to stimulate the social-emotional development of early childhood is quite diverse, including storytelling, role-playing, games, audiovisual media, and animated videos (Liani, nd). Thus, the development and utilization of more varied media and focused on social-emotional stimulation is very important to support the holistic development of early childhood.

Visually engaging learning media is one alternative widely developed to increase early childhood interest and engagement in learning activities. Appealing visuals, such as the use of bright colors, unique shapes, and cheerful designs, are believed to capture children's attention, encourage enthusiasm, and foster their curiosity in learning (Kriswina et al., 2025). One form of learning media that utilizes this visual appeal is educational games designed to resemble robots. The robot shape was chosen solely for its visual uniqueness, which can attract children's attention and interest in learning, without the ability to move, speak, or have other electronic interactive features. Appropriately designed, practical, and engaging games can be a fun learning alternative for young children and provide opportunities for children to learn while playing (Kamila Hertaning et al., nd). Using robot-shaped play media can also help children develop communication skills, collaborate, recognize emotions, and learn to manage them through various play activities designed to suit their developmental stage.

Based on this background, ROBOSA (Robot Box Smart Adventure) was developed as an interactive robot-shaped game media designed to help children aged 4-5 years in recognizing,

understanding, and expressing emotions. ROBOSA is designed in an attractive robot form and can rotate 360 degrees to make it easier for children to interact with each available game. It is also equipped with four types of games, namely GeoBox, MoodBox, WordBox, and SolveBox. Through these four games, children are invited to match shapes, group emotions based on color and expression, compile emotional vocabulary, and practice problem-solving and emotional regulation strategies, perhaps one of which is through role-playing. This series of games is expected to help children recognize, understand, express, and manage their emotions gradually. The development of this media is in line with the principles of early childhood learning which emphasize the importance of play activities as an interactive, safe, fun, and meaningful learning tool to support children's social-emotional development (Putri et al., 2021; Wahyujati, 2022).

This article discusses the development of ROBOSA (Robot Box Smart Adventure) as a play medium for developing the social-emotional skills of children aged 4-5 years, starting from the concept, media design, to its benefits in supporting early childhood learning. The discussion focuses on how ROBOSA helps children recognize, understand, express, and manage emotions through interactive play activities. It is hoped that ROBOSA can become one of the innovative learning media that is effective, interesting, and appropriate to the characteristics of early childhood in supporting children's social-emotional development (Djatmika, 2023; Hasibuan et al., 2022; Sopiah et al., 2023).

2. Method

This research uses the Research and Development (R&D) method with the ADDIE model. The R&D method aims to produce and test the feasibility of an educational product through a systematic development process. (Branch, 2009),The ADDIE model was chosen because it has systematic stages in developing learning media, starting from needs analysis to product evaluation. This model is widely used in learning media development research because it is able to produce valid, practical, and usable products (Sholihah & Kustiawan, 2019).

The analysis stage was conducted through literature studies by reviewing various national and international journals, books, and previous research results regarding the social-emotional development of early childhood, the characteristics of children aged 4-5 years, educational game media, and robot-based learning media, also by conducting initial observations and interviews with Kindergarten Group A teachers at Dharmawanita III Kindergarten, Sukun District, Malang City. The analysis also focused on the need for the development of learning media that can stimulate children's abilities in recognizing, understanding, expressing and managing emotions through play activities. The results of the analysis became the basis for designing the ROBOSA (Robot Box Smart Adventure) media.

The design stage includes the physical design of the ROBOSA (Robot Box Smart Adventure) media, determining learning objectives, developing game flow, and developing assessment instruments. ROBOSA is designed in the form of a robot that can be rotated 360° and consists of four games: GeoBox, MoodBox, WordBox, and SolveBox. The four games are designed according to the characteristics of children aged 4-5 years to stimulate the ability to recognize emotions, understand emotions, express feelings, develop empathy, and train the ability to manage emotions through play activities.

The development stage was carried out by creating a ROBOSA prototype according to the pre-designed design. Next, the product was validated by an early childhood social-emotional material expert to assess aspects of material suitability, completeness of material, clarity of indicators, measurability, and usefulness. Validation was also carried out with a media expert to measure the visual and aesthetic design, pedagogical, technical quality and safety of the media, as well as the practicality and flexibility of the media. User validation was also carried out to obtain input from users reviewed from aspects of material suitability and completeness, clarity and measurability of indicators, visual and aesthetic design, pedagogical suitability, media safety and quality, ease of use and accessibility; and usefulness and flexibility of the media. The validation results were used as a basis for making revisions so that the developed media met the eligibility criteria and was in accordance with learning objectives. The validation stage is an important part of development research to ensure that the product has good quality before use.

The evaluation phase was conducted based on expert validation results and user and teacher input during small-group and large-group testing. All input was used as the basis for refining ROBOSA to make it more effective, practical, safe, and appropriate for the characteristics of early childhood, making it suitable for use as a learning medium (Branch, 2009).

The data collection techniques in this study used expert validation sheets, observation sheets, and documentation. Data were analyzed using quantitative and qualitative descriptive analysis. Quantitative analysis was conducted by calculating the percentage of validation results using the feasibility percentage formula, while qualitative analysis was conducted based on suggestions and input from the validator and observations during implementation. The feasibility criteria refer to (Akbar, 2013), namely 80-100% (very feasible), 60-79% (feasible), 50-59% (less feasible), and 0-49% (not feasible).

3. Results and Discussion

3.1 Results

Analysis Stage

The analysis phase is the initial stage in developing the ROBOSA (Robot Box Smart Adventure) learning media. This phase aims to identify learning needs, student characteristics, and problems encountered in the field, ensuring that the media developed meets user needs.

Observations and interviews with teachers indicate that the social-emotional development of children aged 4–5 years still requires optimal stimulation. Some (46.15%) children still experience difficulties in recognizing their emotions, expressing feelings appropriately, collaborating with friends, waiting their turn, and resolving simple conflicts during play. Children also tend to get angry easily when their desires are not met and are not yet able to control their emotions independently. Furthermore, learning media used in the classroom is still dominated by storybooks, picture cards, and worksheets used separately. These media are not yet able to integrate various aspects of social-emotional development into one interesting and interactive play activity. Teachers also conveyed the need for media that can

be used flexibly, actively involve children, and encourage children to learn through direct experience.

Based on the analysis, the ROBOSA (Robot Box Smart Adventure) learning media was developed, an educational game media based on play activities designed to stimulate the social-emotional skills of children aged 4–5 years. This media integrates several games in one learning box so that children can learn to recognize emotions, express feelings, communicate, cooperate, think logically, and solve social problems gradually through fun play activities.

Design Stage

In the design stage, the ROBOSA learning media design was prepared starting from determining learning objectives, designing media displays, compiling game rules, and compiling assessment instruments. The ROBOSA media was designed in the form of an educational game box consisting of four types of interrelated games. Each game has a different learning objective, but all are directed at developing the social-emotional abilities of children aged 4–5 years. The media design was made using bright colors, attractive illustrations, component sizes that are appropriate for early childhood hands, and safe materials to use, so as to increase children's interest in learning.



Figure 1. ROBOSA (Robot Box Smart Adventure) Media Design

Development Stage

The expert validation test was conducted on a PGPAUD lecturer with expertise in early childhood social-emotional learning. The results of the expert validation test are shown in Table 1.

Table 1. Results of the Material Expert Validation Test

Aspect	Tse	Tsh	P
Material Suitability	20	20	100%
Completeness of Materials	25	25	100%
Clarity of Indicators	20	20	100%
Measurability	19	20	95%
Usefulness	14	15	93.33%
Amount			488.33%
Average			97.66%

Based on the results of the validation test by material experts on the ROBOSA product, the assessment was carried out on five aspects, namely material suitability, material completeness, indicator clarity, measurability, and usefulness. The assessment results showed that the aspects of material suitability, material completeness, and indicator clarity each obtained a percentage of 100%. The measurability aspect obtained 95%, while the usefulness aspect obtained 93.33%. Overall, the results of the validation by material experts obtained an average percentage of 97.66%. These results indicate that the material contained in ROBOSA is in accordance with the social-emotional stimulation needs of children aged 4–5 years. Thus, based on the assessment of material experts, ROBOSA is declared very suitable for use as a medium for social-emotional stimulation for children aged 4–5 years in terms of material.

Table 2. Results of Media Expert Validation Test

Aspect	Tse	Tsh	P
Visual Design and Aesthetics	50	50	100%
Pedagogical	5	5	100%
Engineering Quality and Safety	28	30	93.33%
Practicality and Flexibility	14	15	93.33%
Amount			386.66%
Average			96.665%

Based on the results of the media expert validation test on the ROBOSA product, the assessment was carried out on four aspects, namely visual and aesthetic design, pedagogical, technical quality and safety, and practicality and flexibility. The assessment results showed that the visual and aesthetic design aspects and the pedagogical aspects each obtained a percentage of 100%. Meanwhile, the technical quality and safety aspects and the practicality and flexibility aspects each obtained a percentage of 93.33%. Overall, the media expert validation results obtained an average percentage of 96.665%. These results indicate that ROBOSA has a good visual design, is pedagogically appropriate, safe to use, and is practical and flexible in its use.

Thus, based on the media expert assessment, ROBOSA is declared very suitable for use as a medium to stimulate the social-emotional abilities of children aged 4–5 years.

Table 3. User Validation Test Results

Aspect	Tse	Tsh	P
Suitability and Completeness of Material	14	15	93.33%
Clarity and Measurability	19	20	95%
Visual Design and Aesthetics	19	20	95%
Pedagogical Suitability	10	10	100%
Media Security and Quality	14	15	93.33%
Ease of Use and Accessibility	15	15	100%
Usability and flexibility	15	15	100%
Amount			676.66%
Average			96.66%

Implementation Stage

This implementation phase is the phase for testing the ROBOSA product on children aged 4-5 years as research subjects. The implementation phase includes small group trials and large group trials. The results of the small group trials and large group trials are explained in detail below.

1. Small Group Trial

   A small group trial was conducted on five children aged 4-5 years. The eight indicators observed in this small group trial were: 1) recognizing emotions appropriately; 2) expressing emotions appropriately; 3) demonstrating self-confidence in various activities; 4) demonstrating independence in choosing and completing activities; 5) controlling emotions when facing problems or when experiencing disappointment; 6) controlling behavior according to applicable rules; 7) waiting one's turn patiently; 8) completing tasks completely. The results of the small group trial can be seen in Table 4 below.

Table 4. Small Group Test Results

No	Child's Name	Social Emotional Indicators							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1.	SB	3	3	3	3	3	3	3	3
2.	IC	3	3	3	2	3	2	2	3
3.	AT	3	3	3	3	3	2	1	3
4.	NS	2	3	2	2	2	2	2	3
5.	FR	3	3	3	3	3	3	3	3

No	Child's Name	Social Emotional Indicators							
		1	2	3	4	5	6	7	8
	Tse	14	15	14	13	14	12	11	15
	Tsh	15	15	15	15	15	15	15	15
	Percentage	93.33	100	93.33	86.67	93.33	80	73.33	100

Based on the results of a small group trial of 5 children, the achievement results for 8 social-emotional indicators were between 73.33% and 100%. The overall score obtained was 108 out of a maximum score of 120, resulting in a percentage of 90%. Achievements for indicator 1 were 93.33%, indicator 2 was 100%, indicator 3 was 93.33%, indicator 4 was 86.67%, indicator 5 was 93.33%, indicator 6 was 80%, indicator 7 was 73.33%, and indicator 8 was 100%. Based on these data, indicators 2 and 8 achieved the highest achievement, namely 100%, while the lowest achievement was found in indicator 7 at 73.33%. Overall, the small group trial results showed a 90% achievement rate, indicating that ROBOSA (Robot Box Smart Adventure) is highly suitable for use as a medium for social and emotional stimulation for children during the small group trial phase. However, indicators with relatively lower achievement rates require attention in refining the media and implementing activities in subsequent stages.

2. Large Group Trial

The large-group test was conducted on 12 children aged 4-5 years, using the same eight socio-emotional indicators as the small-group test. The results of the large-group test can be seen in Table 5 below.

Table 5. Large Group Test Results

No	Child's Name	Social Emotional Indicators							
		1	2	3	4	5	6	7	8
1.	IZ	3	3	3	3	3	3	3	3
2.	KR	3	3	3	3	3	3	3	3
3.	ND	3	2	3	3	3	3	3	3
4.	VN	3	3	3	3	3	3	3	3
5.	DF	3	2	2	2	3	3	3	3
6.	LD	2	2	1	2	1	2	2	2
7.	AR	3	3	3	3	3	3	3	3
8.	GL	3	3	3	3	3	3	3	3
9.	AK	3	3	3	3	3	3	3	3
10.	MR	3	3	3	3	3	3	3	3
11.	AL	3	2	3	3	3	3	3	3
12.	RK	3	3	3	3	3	3	3	3
	Tse	34	32	33	34	34	35	34	35
	Tsh	36	36	36	36	36	36	36	36
	Percentage	94.44	88.88	91.67	94.44	94.44	97.22	94.44	97.22

Based on the results of a large group trial on 12 children, the percentage of achievement in eight social-emotional indicators was 88.88%–97.22%. The indicator of recognizing emotions correctly obtained 94.44%, expressing emotions correctly 88.88%, showing self-confidence 91.67%, independence in choosing and completing activities 94.44%, controlling emotions when facing problems or disappointments 94.44%, controlling behavior according to rules 97.22%, waiting one's turn patiently 94.44%, and completing tasks completely 97.22%. Overall, a score of 271 was obtained out of a maximum score of 288, with a percentage of 94.10%. The highest percentage was found in the indicator of controlling behavior according to rules and completing tasks completely, while the lowest percentage was found in the indicator of expressing emotions correctly. The results of the large group trial indicate that ROBOSA (Robot Box Smart Adventure) is very suitable for use as a medium for children's social-emotional stimulation, based on the achievements in the eight indicators observed.

Evaluation Stage

The final stage of this development research is the evaluation stage of the ROBOSA media display and its implementation. The evaluation results were obtained from suggestions provided by material experts, media experts, users, and also the results of small group and large group trials. The suggestions obtained were: 1) consideration for ease of access to ROBOSA media, so that it is easy to carry to various places and needs, 2) it is best to use basic colors (red, yellow, and blue) on ROBOSA media. Based on these suggestions, researchers will make improvements to the development of ROBOSA media.

3.2 Discussion

The results of the study indicate that the ROBOSA (Robot Box Smart Adventure) learning media meets the media eligibility criteria, making it suitable for use as a learning medium to stimulate the social-emotional abilities of children aged 4-5 years. Based on the results of expert validation, the ROBOSA media obtained a very suitable category. This finding indicates that the visual and aesthetic design, pedagogical suitability, technical quality and safety of the media, as well as the practicality and flexibility of the media are in accordance with the characteristics of early childhood development. These results are in line with the statement that a product resulting from development is said to be suitable if it has gone through a validation process so that the content, design, and presentation aspects are in accordance with the learning objectives. In addition, learning media designed according to the characteristics of child development will be easier to understand, attract attention, and can increase children's involvement in the learning process. Obtaining this very valid category is also in line with the findings of Astuti as a material expert in the development of the KidSafe Game media for children aged 4-5 years, where learning media that go through a strict validation stage by material experts and media experts in the same age range are proven to obtain high validity scores and are suitable for use in early childhood learning (Ammalyah et al., 2024).

The validation results from media experts also showed that ROBOSA has an attractive visual appearance and game components that are easy for children to use. This suggests that visual design is a factor that supports children's media acceptance. This finding aligns with the opinion of (Smaldino et al., 2019) which explains that learning media with attractive, simple visual displays that are appropriate to student characteristics can increase attention, motivation, and engagement during the learning process. In early childhood, engaging visual elements also

play a crucial role in maintaining focus and encouraging children to actively explore media through play. This reinforces the findings.(Ammalyah et al., 2024)in the development of Pyramid Game media to stimulate the symbolic thinking skills of children aged 5-6 years, which concluded that visual components in concrete, colorful, and proportional forms were proven to be more easily accepted and attracted children's interest in being actively involved compared to abstract media.

The study also showed that the use of ROBOSA was effective in improving children's social-emotional skills. After participating in learning using ROBOSA, children showed improvements in recognizing various types of emotions, expressing feelings verbally, communicating with friends, working together in groups, showing empathy, and choosing appropriate solutions when facing simple social situations. These findings suggest that structured play activities provide children with opportunities to practice various social-emotional skills directly through real-life experiences. These findings reinforce the results of the study (Aliya et al., 2023) which found that puzzle game media has been proven to stimulate the social emotional development of early childhood through direct interaction between children during play, as well as research (Annisabella & Mallevi, 2023) regarding the Expression Chess media which shows that games based on recognizing facial expressions and colors are effective in helping children aged 5-6 years identify types of emotions concretely.

ROBOSA's effectiveness can be explained through the complementary characteristics of each game. GeoBox encourages children to communicate, collaborate, and share their work, there by developing self-confidence and social interaction skills. MoodBox helps children recognize, understand, and manage emotions through identifying facial expressions, colors, and personal experiences. WordBox enriches emotional vocabulary, making it easier for children to express their feelings verbally. Meanwhile, SolveBox provides children with experiences in understanding various social situations, recognizing emerging emotions, demonstrating empathy, and determining solutions to simple problems. This series of activities demonstrates that social-emotional learning is more effective when children have the opportunity to experience, discuss, and practice social behavior directly in a playful setting. This principle of direct involvement is also evident in research (Ade et al., 2023)about improving the social and emotional well-being of early childhood through role play, which concluded that structured play activities provide space for children to practice social skills in situations that resemble real life, rather than just being introduced verbally by teachers.

These findings are in line with research (Pyle et al., 2022)which explains that play-based learning can improve children's self-regulation, collaboration, communication, and social-emotional development because they gain learning experiences through meaningful social interactions. During play, children learn to understand others' perspectives, express emotions appropriately, resolve simple conflicts, and build positive social relationships. This finding is further supported by research (Samawi & Astuti, 2023) in the development of a QR code-based picture story book containing local culture to stimulate the social and emotional aspects of children aged 5-6 years, which emphasizes that the digitalization era has reduced the opportunity for children to learn directly through interaction with their social environment, so that learning media that deliberately re-presents the experience of social interaction, such as the ROBOSA game through group activities, is becoming increasingly relevant to address these limitations.

In addition, the results of this study are in line with the Social and Emotional Learning (SEL) framework developed by the Collaborative for Academic, Social, and Emotional Learning (CASEL, 2020). CASEL explains that social emotional development includes self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. All of these components are facilitated through activities in ROBOSA, starting from recognizing emotions in MoodBox, expressing emotions through WordBox, collaborating in GeoBox, to choosing the right

solution through SolveBox. This structural alignment is one of ROBOSA's strengths compared to early childhood learning media in general, which tend to only target one or two SEL components, as found in studies (Rupnidah & Suryana, 2022) about early childhood learning media which revealed that most of the media circulating in the field still focuses on cognitive or motor aspects and has not fully integrated the five social emotional competencies at once in one media.

Thus, the results of this study indicate that ROBOSA not only meets the eligibility requirements as a learning medium but also has a strong theoretical basis in supporting the social and emotional development of early childhood. The integration of play activities, social interaction, communication, emotional reflection, and problem-solving makes ROBOSA a learning medium capable of providing meaningful learning experiences while supporting the achievement of social and emotional learning goals in children aged 4-5 years. However, this study is still limited to one population/trial location and short-term measurements, so the generalization of ROBOSA's success in other PAUD contexts with different teacher, child, and environmental characteristics still needs to be further tested through research with a wider design and sample.

3. Conclusion and Suggestion

This Research and Development (R&D) study successfully developed ROBOSA (Robot Box Smart Adventure) as a play medium for developing the social and emotional skills of children aged 4-5 years. The media development refers to the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, so that the product was developed systematically through the stages of needs analysis, design, development, expert validation, implementation, and evaluation.

ROBOSA consists of four games: GeoBox, MoodBox, WordBox, and SolveBox, designed to help children recognize, understand, express, and manage emotions through interactive and fun play activities. Each game provides opportunities for children to communicate, collaborate, develop empathy, and build positive social interactions in accordance with the developmental characteristics of early childhood.

Validation results by media experts, material experts, and PAUD teachers indicate that ROBOSA achieved a feasibility percentage that was entirely in the "Very Feasible" category. Product trial results also demonstrated that this media was able to attract children's interest in actively participating in each game and provided a learning experience that supported the stimulation of social-emotional development. Based on these results, it can be concluded that ROBOSA meets the valid and practical criteria as a game media that is suitable for use in supporting the social-emotional development of children aged 4-5 years.

Based on all stages of ROBOSA research and development, several limitations remain that should be considered for further product development. This research is still limited to the product development and feasibility testing stages, so it has not yet tested the effectiveness of ROBOSA's use on children's social-emotional development in depth. Therefore, further research is recommended to conduct effectiveness tests using experimental or quasi-experimental designs, such as a pretest-posttest control group design, so that the influence of ROBOSA's use on children's social-emotional development can be measured more comprehensively.

Furthermore, ROBOSA implementation needs to be conducted in various early childhood education institutions with a wider variety of subjects to obtain a broader picture of the media's effectiveness and practicality. Further development is also recommended to add variations in games, emotional situations, and interactive activities so that the media can be used continuously without causing boredom in children. Furthermore, developing a digital version or companion application for ROBOSA could be an alternative to expand access to the media. Teacher and parent involvement also needs to be optimized so that stimulation of children's social and emotional development can be carried out continuously, both at school and at home.

Reference

Ade, L. H., Rosmaimuna, S., & Jumaita, N. L. (2023). Upaya Meningkatkan Perkembangan Sosial-Emosional Anak Usia Dini Melalui Bermain Peran [Efforts to Improve Early Childhood Social-Emotional Development Through Role Play]. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *7*(4), 4871–4880.

Aghnaita, & Irmawati. (2022). Bahaya Perkembangan Sosial Emosional Anak Usia Dini [The Dangers of Early Childhood Social-Emotional Development]. *Jurnal Ilmiah Pesona PAUD*, *9*(1), 1–11. https://ejournal.unp.ac.id/index.php/paud/article/view/112470

Akbar, S. (2013). *Instrumen Perangkat Pembelajaran* [Learning Device Instruments]. PT Remaja Rosdakarya.

Aliya, B., Elan, & Gilar, G. (2023). Stimulasi Perkembangan Sosial-Emosional Anak Usia Dini Melalui Penggunaan Media Permainan Puzzle [Stimulating Early Childhood Social-Emotional Development Through the Use of Puzzle Games]. *Jurnal PAUD Agapedia*, *7*(2), 184–189.

Ammalyah, P., Iriyanto, T., & Astuti, W. (2024). Media Pyramid Game untuk Menstimulasi Kemampuan Berpikir Simbolik Anak Usia 5-6 Tahun [Pyramid Game Media to Stimulate Symbolic Thinking Skills in 5-6 Year Old Children]. *Jurnal Caksana: Pendidikan Anak Usia Dini*, *8*(2). https://doi.org/10.31326/jcpaud.v8i2.2341

Annisabella, A. G., & Mallevi, A. N. (2023). Pengembangan Media Catur Ekspresi Untuk Menstimulasi Kemampuan Mengenal Emosi Pada Anak Usia 5-6 Tahun [Development of Expression Chess Media to Stimulate the Ability to Recognize Emotions in Children Aged 5-6 Years]. *Jurnal Caksana: Pendidikan Anak Usia Dini*, *6*(1), 31–40.

Branch, R. M. (2009). *Instructional Design: The ADDIE Approach*. Springer.

Collaborative for Academic and Emotional Learning (CASEL), S. (2020). *CASEL's SEL Framework: What Are the Core Competence Areas and Where Are They Promoted?* CASEL. https://casel.org/

Djatmika, G. H. (2023). The Influence of Practical Lecturer Competence and Innovation on Improving Soft Skills and Hard Skills in Early Children. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(2), 1836–1846. https://doi.org/10.31004/obsesi.v7i2.4140

Hasibuan, R., Fitri, R., & Dewi, U. (2022). STEAM-Based Learning Media: Assisting in Developing Children's Skills. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *6*(6), 6863–6876. https://doi.org/10.31004/obsesi.v6i6.3560

Kamila Hertaning, P., Iriyanto, T., Astuti, W., Kunci, K., Kreatif, B., & Kritis, B. (n.d.). *Jurnal Caksana : Pendidikan Anak Usia Dini Pengembangan Media Permainan Prisca (Petualangan Rasional Imajinatif Seru Cita Anak) Untuk Menstimulasi Kemampuan Berpikir Kritis fan Kreatif Anak Usia 5-6 Tahun* [Early Childhood Education Development of Prisca Game Media (Fun Imaginative Rational Adventure for Children) to Stimulate Critical and Creative Thinking Skills of 5-6 Year Old Children]. https://doi.org/10.31326/jcpaud.v8i2.2444

Kriswina, D., Muntomimah, S., & Akbar, M. R. (2025). Peningkatan Kemampuan Daya Ingat Anak Usia 4-5 Tahun Melalui Number Card [Improving Memory Skills of 4-5 Year Old Children Through Number Cards]. *Jurnal Caksana : Pendidikan Anak Usia Dini*, *8*(2), 851–862. https://doi.org/10.31326/jcpaud.v8i2.2341

Liani, P. N. (n.d.). *DZURRIYAT: Jurnal Pendidikan Islam Anak Usia Dini e-ISSN 2987-128X Media Pembelajaran Efektif Dalam Menstimulasi Perkembangan Sosial Emosional Anak Usia Dini* [Effective Learning Media in Stimulating the Social and Emotional Development of Early Childhood]. Retrieved http://ejournal.yayasanpendidikandzurriyatulquran.id/index.php/dzurriyat

Purwaningsih, P., Munawar, M., & Hariyanti, D. P. (2022). Analisis Pembelajaran Lingkungan Sosial Berbasis STEAM pada Anak Usia Dini [Analysis of STEAM-Based Social Environmental Learning in Early Childhood]. *Murhum: Jurnal Pendidikan Anak Usia Dini*, *3*(1), 13–23. https://doi.org/10.37985/murhum.v3i1.68

Putri, M. A., Wulandari, C., & Febriastuti, A. R. (2021). Implementasi Pendekatan Pembelajaran STEAM Berbahan Loose Parts dalam Mengembangkan Keterampilan Abad 21 pada Anak Usia Dini [Implementation of the Loose Parts-Based STEAM Learning Approach in Developing 21st-Century Skills in Early Childhood]. *Journal of Islamic Early Childhood Education*, *2*(2), 118–130.

Pyle, A., Prioletta, J., & Poliszczuk, D. (2022). Play-Based Learning and Kindergarten Pedagogy: A Review of the Literature. *Journal of Childhood, Education & Society*.

Rupnidah, R., & Suryana, D. (2022). Media Pembelajaran Anak Usia Dini [Early Childhood Learning Media]. *Jurnal PAUD Agapedia*, *6*(1), 49–58.

Samawi, A., & Astuti, W. (2023). Pengembangan Buku Cerita Bergambar Berbasis Kode QR Dengan Insersi Budaya Lokal [Development of QR Code-Based Picture Storybooks with Local Cultural Inclusion]. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *7*(4).

Sholihah, S. R. U., & Kustiawan, U. (2019). Pengembangan Media Pembelajaran Edupoint bagi Anak Usia 5-6 Tahun [Development of Edupoint Learning Media for Children Aged 5-6 Years]. *Jurnal PAUD: Kajian Teori Dan Praktik Pendidikan Anak Usia Dini*.

Smaldino, S. E., Lowther, D. L., & Russell, J. D. (2019). *Instructional Technology and Media for Learning*. Pearson.

Sopiah, N. S., Mulyadi, S., & Loita, A. (2023). *Implementasi Pembelajaran Steam Melalui Permainan Coding Robotik dalam Melatih Problem-Solving Anak Usia Dini* [Implementation of Steam Learning Through Robotic Coding Games in Training Early Childhood Problem-Solving]. *6*(2). https://doi.org/10.24252/nananeke.v6i2.39735

Sulistyawati, Astuti, I., & Enawaty, E. (2023). Needs Analysis on Robmanjar (Learning Partner Robot) Game Design to Stimulate Early Childhood Literacy. *International Journal of Multi-Discipline Science*, *6*(2), 88–98. https://doi.org/10.26737/ij-mds.v6i2.4412

Wahyujati, B. B. (2022). Panduan Dasar Konsep Perancangan Mainan Robot Edukasi untuk Media Belajar Anak Usia Dini dengan Pendekatan Persepsi Orang Tua [Basic Guide to Educational Robot Toy Design Concepts for Early Childhood Learning Media with a Parental Perception Approach]. *Jurnal Desain*, *9*(3), 401–414. https://doi.org/10.30998/jd.v9i3.11938